

SOME BATHYPELAGIC CEPHALOPODS  
FROM SOUTH AFRICAN WATERS<sup>1</sup>

By

GILBERT L. VOSS

*Institute of Marine Science, University of Miami*

(With 9 plates)

CONTENTS

	PAGE
Introduction . . .	61
Systematic List . . .	62
Systematic Section . . .	63
Summary . . .	87
Acknowledgements . . .	87
References . . .	87

INTRODUCTION

Through the kindness of Mr. M. J. Penrith and Dr. J. R. Grindley of the South African Museum the writer received in 1963 a small collection of cephalopods taken during the course of midwater trawling (Grindley and Penrith, 1965) in South African waters, mostly off the coast of Natal. The collections consisted of 112 specimens belonging to 17 families, 28 genera and 32 species of which 13 species were unrecorded in the list of South African cephalopods given by the writer in 1962 (Voss, 1962).

Although only one new species and one new subspecies were found, several of the other species are poorly known or confused in the literature and these are treated in some detail in the present paper. One new species is named on the basis of a description by another author. The remainder are listed for the record with a reference to pertinent literature treating with the individual species and with an indication of their general distribution. The collections were obtained by the use of an Isaacs-Kidd midwater trawl (IKMT). A few were from stomach contents of the predatory bathypelagic fish *Alepisaurus ferox*, which were taken by long-line at IKMT stations. All of the specimens are deposited in the South African Museum (SAM).

<sup>1</sup> Contribution No. 789 from the Institute of Marine Science, University of Miami. This study was partially supported by National Science Foundation grants G-17940 and GB 1090.

## SYSTEMATIC LIST

In the paper 'South African Cephalopods', the writer (Voss, 1962) reviewed the cephalopod literature treating with the South African region and gave a list of 66 species reported as of that date from South African waters. The present list increases this number to 79 if some localities as much as 600 miles off shore may be referred to as South African. This increase was to be expected when sampling gear such as the Isaacs-Kidd trawl was introduced in addition to more customary fishing gear and undoubtedly its continued use will sensibly increase the number of species so far recorded, especially among those weird inhabitants of the deep cold waters so difficult to obtain with conventional nets.

The list given below includes only those species which were taken in the above-mentioned survey. The species preceded by an asterisk are new records to the South African cephalopod fauna.

## Order SEPIOIDEA

Family **Spirulidae**

1. *Spirula spirula* (Linnaeus)

Family **Sepiidae**

2. *Sepia australis* Quoy and Gaimard
3. *S. hieronis* (Robson)
4. *Hemisepius typicus* Steenstrup

Family **Sepiolidae**

5. *Rossia (Australrossia) enigmatica* Robson
6. *Heteroteuthis hawaiiensis dagamensis* Robson
7. *Inioteuthis capensis* Voss

## Order TEUTHOIDEA

## Suborder OEGOPSIDA

Family **Lycoteuthidae**

8. *Lycoteuthis diadema* (Chun)

Family **Enoploteuthidae**

9. *Abraliopsis gilchristi* (Robson)
- \*10. *A. pfefferi* Joubin
- \*11. *Pyroteuthis margaritifera* (Rüppell)
- \*12. *Pterygioteuthis gemmata* Chun

Family **Onychoteuthidae**

13. *Onychoteuthis banksi* (Leach)
14. *Onykia* sp.
15. *Tetronychoteuthis dussumierii* (Orbigny)

Family **Bathyteuthidae**

- \*16.
- Ctenopteryx sicula*
- (Verany)

Family **Veranyidae**

- 17.
- Octopodoteuthopsis*
- sp.

Family **Histioteuthidae**

- \*18.
- Histioteuthis dofleinii*
- (Pfeffer)

- \*19.
- H. bonnellii*
- (Férussac)

- 20.
- H.*
- sp.

- \*21.
- H. meleagroteuthis*
- (Chun)

Family **Ommastrephidae**

- \*22.
- Todaropsis eblanae*
- (Ball)

- \*23.
- Ornithoteuthis*
- sp.

Family **Chiroteuthidae**

- \*24.
- Chiroteuthis capensis*
- , n. sp.

Family **Cranchiidae**

- 25.
- Cranchia scabra*
- Leach

- 26.
- Galiteuthis*
- sp.

- 27.
- Pyrgopsis pacifica*
- Issel

- \*28.
- Megalocranchia megalops australis*
- , n. subsp.

## Order OCTOPODA

Family **Bolitaenidae**

- 29.
- Eledonella pygmaea*
- Verrill

Family **Amphitretidae**

- 30.
- Amphitretus pelagicus*
- Hoyle

Family **Tremoctopodidae**

- \*31.
- Tremoctopus violaceus*
- (Della Chiaje)

Family **Ocythoidea**

- \*32.
- Ocythoe tuberculata*
- Rafinesque

- 33.
- Octopus*
- sp.

## SYSTEMATIC SECTION

## Order SEPIOIDEA

Family **Spirulidae***Spirula spirula* (Linnaeus, 1758)*Spirula spirula*, Bruun, 1943 (biology).*Material*: 1 ♂, mantle length 43.7 mm, in 500 m, from 32°30'S, 35°08'E, IKMT No. 31, August 12, 1962, SAM A29725.—1 ♀, mantle length 38.8 mm, in

200 m, from 30°31'S, 31°45'E, IKMT No. 37, August 23, 1962, SAM A29701.— 1 juvenile, mantle length 24.0 mm, in 500 m, from 29°55'S, 39°30'E, IKMT No. 35, August 19, 1962, SAM A29695.

This species was reported from off the Cape by Bruun (1943) taken by the Dana. Its general biology is well treated in the paper. The species is apparently circumtropical and warm temperate living at depths from 200 to about 1700 metres.

*Distribution*: Circumtropical and warm temperate in 200 to 1700 metres.

### Family **Sepiidae**

#### *Sepia australis* Quoy and Gaimard, 1832

*Sepia australis*, Voss, 1962 (full synonymy).

*Material*: 1 ♂, mantle length 34.0 mm, 1 ♀, mantle length 35.0 mm, in 40 m, from west of Slangkop, IKMT No. 12, September 7–8, 1961, SAM A29627.— 2 ♀♀, mantle lengths 39.0–53.0 mm, in 100 m, from west of Slangkop, IKMT No. 19, September 11–12, 1961, SAM A29734.

This species has been discussed and pertinent literature listed in Voss (1962).

*Distribution*: Known only from southern Africa. See Adam (1941) for complete distribution records.

#### *Sepia hieronis* (Robson, 1924)

*Sepia* sp. A. Robson, 1924: 13.

*Rhombosepion hieronis* Robson, 1924b: 645, pl. 2, figs. 9, 11; Massy, 1927: 158.

*Sepia hieronis*, Voss, 1962: 254.

*Material*: 1 ♂, mantle length 61.3 mm, in 250 m, from west of Slangkop, IKMT No. 23, November 14–15, 1961, SAM A29728.

The sole specimen, a male, was in good condition. Typically for the species, the dorsal arms had only two rows of suckers while both pairs of lateral arms have a patch of enlarged suckers near the tips.

*Distribution*: Cape Town, 112–150 fathoms (Robson); off Lion's Head, 175–230 fathoms (Massy); 34°09.8'S, 18°16.5'E in 79 metres and 34°09'S, 18°17.5'E in 43 metres (Voss).

#### *Hemisepius typicus* Steenstrup, 1875

*Hemisepius typicus* Steenstrup, 1875: 468; Chun, 1912: 411; Massy, 1927: 164; Thore, 1945: 50; Voss, 1962: 252.

*Material*: 7 ♂♂, mantle length 8.0–16.0 mm, 6 ♀♀, mantle length 7.8–13.0 mm, from SSE. of Yzervark Point, IKMT No. 2a, SAM A29717.

The present specimens were in very good condition. Their presence in a midwater trawl catch introduces some interesting questions as to their natural



habitat. This species deserves more attention from biologists than it has received in the past.

*Distribution*: South Africa.

### Family **Sepiolidae**

#### *Rossia (Austrossia) enigmatica* Robson, 1924

*Semirossia* sp. A. Robson, 1924a: 10.

*Rossia enigmatica* Robson, 1924b: 635; Massy, 1927: 153.

*Rossia* sp. A. Robson, 1925: 450

*Rossia (Austrossia) enigmatica*, Voss, 1955: 89; 1962: 253.

*Material*: 1 ♀, mantle length 20.0 mm, from north-west of Cape Town in 400 m, IKMT No. 26, November 15–16, 1961, SAM A29696. — 1 ♀, 5 ♂, badly distorted from the trawl, from 33°10'S, 17°20'E in 120 m, IKMT No. 51, September 18–19, 1963, SAM A29808. — 2 ♂, badly distorted from the trawl, from 33°10'S, 17°20'E in 280 m, September 17–18, 1963, SAM A29806.

For a full discussion of this species see Voss (1962). The present specimens conform well to the description.

*Distribution*: South Africa.

#### *Heteroteuthis (Stephanoteuthis) hawaiiensis dagamensis* Robson, 1924

*Heteroteuthis hawaiiensis* var. *dagamensis* Robson, 1924a: 11; 1924b: 632.

*Heteroteuthis (Stephanoteuthis) hawaiiensis dagamensis*, Voss, 1955: 93; 1962: 253

*Material*: 1 ♀, mantle length 20.5 mm, 28°07'S, 33°28'E in 500 m, IKMT No. 47, SAS Natal, February 24, 1963, SAM A29747. — 5 badly mangled specimens from IKMT No. 51, SAM A29808. — 5 badly mangled specimens from IKMT No. 50, SAM A29806.

A single large female of this species was taken in the hauls. It conforms well with Robson's description.

*Distribution*: Known only from off South Africa.

#### *Iniotheuthis capensis* Voss, 1962

*Iniotheuthis capensis* Voss, 1962: 255, fig. 1 a–c.

*Material*: 1 ♀, mantle length 10.0 mm, from SSE. of Yzervark Point, IKMT No. 2a, SAM A29718.

This beautifully preserved small female seems referable with little doubt to this species. Because of its small size little can be added to the original description. The fins are larger than in the type material and there is a papilla-like pore, not seen before, on each side of the light organ on the liver.

*Distribution*: This species is known only from South Africa from the vicinity of Saldanha Bay and Mossel Bay.

## Sepiolid indet.

*Material*: 1 badly mangled juvenile from west of Slangkop in 100 m, IKMT No. 19, September 9, 1961, SAM A29736.

No identification of this mangled specimen was attempted.

## Order TEUTHOIDEA

## Suborder OEGOPSIDA

Family **Lycoteuthidae***Lycoteuthis diadema* (Chun, 1900)

*Lycoteuthis diadema*, Voss, 1962: 262 (South African references); 1962a: 275 (revision of the family).

*Material*: 1 ♀, mantle length 38.6 mm, from west of Slangkop in 350 m, IKMT No. 16, September 9, 1961, SAM A29732. — 1 juvenile, mantle length 12.3 mm, from west by south of Slangkop in 250 m, IKMT No. 7, May 25, 1961, SAM A29709.

Examination of the present specimens confirms my opinion that *Leptodontoteuthis inermis* Robson, 1926 from South Africa is conspecific. This is an uncommon species living in the mesopelagic zone. Its photophores have been well studied, described and illustrated by Chun (1910) from *Valdivia* specimens.

*Distribution*: Gulf of Mexico and Straits of Florida (Voss); west coast of South America; Indian Ocean in 46°S, 120°E, Atlantic Ocean (all Pfeffer); Benguela Current in 31°21'S, 15°58'E, West Wind Drift in 40°31'S, 15°06'E (all Chun); South Africa, Cape Marine Province (Robson).

Family **Enplototeuthidae***Abraliopsis gilchristi* (Robson, 1924)

Pl. I, a-d; Pl. II, a-e; Pl. III, a-h

*Abralia gilchristi* Robson, 1924a: 3; 1924b: 601, pl. 1, text-figs. 6-7.

*Abraliopsis gilchristi*, Voss, 1962: 264.

*Material*: Cotypes, 2 ♂♂ (only one measurable), mantle length 37.0 mm, Sta. 81, Cape Town, 280 fathoms, Sta. 84, Cape Town, 240 fathoms, presented by Committee on Fisheries and Marine Biological Survey, Union of South Africa, by Dr. J. Gilchrist. BM 1924.9.9.41-2. — 2 ♂♂, mantle length 35.5-38.9 mm, 1 ♀, mantle length 37.0 mm, IKMT No. 15, in 15 m west of Slangkop, South Africa, September 8, 1961, SAM A29729. — 1 ♂, mantle length 34.0 mm, 1 juvenile, mantle length 16.5 mm, IKMT No. 16, in 350 m west of Slangkop, South Africa, September 8, 1961, SAM A29732. — 1 juvenile, mantle length 18.0 mm, IKMT No. 15, in 15 m west of Slangkop, South Africa, September 8, 1961, SAM A29706. — 1 juvenile, mantle length 8.0 mm, IKMT No. 5, in 10 m west of Slangkop, October 1, 1961, SAM A29710.

This species was discussed in my 1962 paper on the basis of an examination of the cotypes in the British Museum, and certain discrepancies between the specimens and Robson's description were pointed out. With the new material listed above, it has been possible to redescribe this species and figure it in sufficient detail that its future recognition should hold no difficulties.

*Description:* The mantle is long, conical and slender, tapering to a sharp point posteriorly. The anterior margin is broadly triangularly produced in the dorso-median area but ventrally is shallowly excavated beneath the funnel with small lateral lappets. The fins are large, occupying over four-fifths of the mantle length. They have conspicuous free anterior lobes. The anterior margin is convex with rounded lateral angles and the posterior margins are concave, with the fins drawn out into a long tail and united posteriorly by a low ridge.

The funnel is of medium size, barely reaching the posterior level of the eyes, and is joined to the head by a single V-bridle. The funnel-mantle locking apparatus is simple, the funnel member a broad, short groove, the mantle member a long, straight, narrow ridge. The funnel valve is very broad and only slightly curved. The dorsal member of the funnel organ is  $\Lambda$ -shaped. The anterior end is pointed and pressed together laterally forming a small, ventrally turned, grooved papilla. Slightly posteriorly there originates a low ridge which becomes stronger posteriorly forming a low lappet in the centre of each limb. The ventral pads are compactly oval.

The head is large, squarish, with conspicuous eyes. The eyelids are transversely oval with a distinct sinus anteriorly. There are four nuchal folds on each side. The first is blunt and inconspicuous, little more than the rounded corner of the funnel groove. The second is immediately adjacent to the first, small but distinct, and terminates in a small, tongue-shaped, olfactory organ. The third and fourth are distinct folds united posteriorly by a thin, raised, concentric-shaped fold. The buccal membrane is coloured a dark purple with numerous small papillae on the oral surface. It is eight-lobed with eight supports which are attached dorsally on I, II and IV, ventrally on III.

The arms are nearly round in cross-section, slightly laterally compressed, with an approximate formula of 4.2.3.1. Arms I and II are keeled on their distal half or one-third, III is keeled for its entire length, the keel deepest about two-thirds of the length from the base and IV bears only the tentacular sheath on the outer border. All of the arms in both the males and females have two rows of very sharp, slender, strongly curved hooks which become extremely minute distally and are followed immediately by minute, apparently non-ringed suckers in two rows.

In the females, all of the arms are bordered by trabeculate protective membranes which are almost vestigial on the dorsal side of arms I, II and III and on both sides of IV but are well developed on the ventral sides of I, II and III, being rather deep on the latter. In the females both membranes and the lappets are smooth.



In the males, the right ventral arm is hectocotylized as is shown in the figure. Basally, the hooks are of about equal size but in the middle of the arm those of the ventral row suddenly are reduced in size continuing thus to the end of the arm while those of the dorsal row retain their normal size. Along the basal and midportion of the arm the protective membrane is lost and only the broad, flat, somewhat truncate trabeculae remain. In the distal third a broad fleshy flap is found on the ventral border. Near the end of the arm it nearly disappears but immediately expands again and extends to the base of the first of the terminal light organs. On the dorsal side another flap appears at about the middle of the large ventral flap and tapers gradually to the base of the light organ; distally the two form a deep, narrow groove.

The left ventral arm is not modified but the protective membrane is either low or absent and the trabeculae are enlarged to form long, square-tipped, flat flaps.

The protective membranes are also modified on I, II, and III in the males. On I the dorsal border has only small lappets but the ventral border has a membrane between the trabeculae. The latter are often somewhat dentate on their free borders and terminal flaps and there are some slight rugosities on the basal part of the arm proximal of the suckers. On II the basal oral surface of the arm has numerous minute papillae followed by low flap-like trabeculae with few papillae on them on each side of the arm. In the middle third of the arm the ventral trabeculae and membrane become wide, having papillae both on the membrane and the trabeculae. Dorsally only flaps are developed which also bear papillae. In the distal third the flaps and membranes decrease and finally disappear. On III there are flaps dorsally, narrow trabeculae, and full deep membranes ventrally but neither show any trace of papillae.

The tentacles are long and laterally compressed. The clubs are not expanded. The carpal cluster is well separated from the manus and consists of four or five small suckers and about the same number of pads. The manus bears four small hooks on the dorsal side and four large, slender hooks on the ventral side. The dactylus is very short and has about twelve transverse rows of suckers in four longitudinal rows. There is a large somewhat semicircular flap on the ventral border of the club originating at about the middle of the carpus and terminating at about the base of the first ventral hook. Beyond this there is a low membrane bordering the manus but terminating at the dactylus. There is no membrane dorsally. On the aboral surface of the club is a swimming keel which originates about in the middle of the manus and extends to the tip of the dactylus.

The gladius is typically enoploteuthid in shape.

The male genitalia are on the left side and are extremely large for an enoploteuthid. The females have two large nidamental glands and a pair of slender, highly arched supplementary ones.

The light organs on the skin are of the two types: large ones with clear

bead-like centres with dark rings deeply set into the mantle but projecting upward under the epithelium and smaller ones about half the size with darker, smaller centres with broad darker rings, which are not set as deeply into the mantle.

On the mantle these organs are numerous and closely but irregularly distributed on the ventral surface, much sparser on the dorsal surface anterior to the fins. Occasionally there is a clear ventral midstripe. On the funnel there are four symmetrical ventral patches, two on each side of the midline and a band of photophores dorsally on each side of the bridle.

On the ventral side of the head are the characteristic four distinct rows of photophores which so easily distinguish the species. There is a double row of light organs on the midline, slightly separated and with a few scattered small organs between. These two rows originate just within the funnel groove and extend in a straight line out the ventral arms as the inner row of IV. The lateral row on each side is widely separated from the inner row on both the head and ventral arms with no intervening photophores. This row forms the median row of IV but actually is located near the outer border. Between the lateral rows on each side and the circlet of organs around each eyelid are rather numerous scattered photophores not interrupted by a ventral window and of which some form the single widely separated organs along the tentacular sheath of IV. There are no organs on the dorsum of the head.

On IV the light organs are as described above but only those of the dorso-median row extend to the tip of the arm, the others stopping somewhat below the terminal organs. There is a conspicuous, rather closely set row of photophores on III, originating from the eyelid circlet just dorsal of the anterior sinus and extending along the base of the swimming keel on the ventral surface almost to the tip of the arm.

Two other sets of light organs, on the eyeball and on the tips of the ventral

TABLE I. Measurements (in mm) of six specimens of  
*Abraliopsis gilchristi* (Robson, 1924) from South African waters

Trawl number	. . .	16	16	15	15	15	15
Sex	. . .	juv.	♂	juv.	♂	♂	♀
Mantle length	. . .	16.5	34.0	18.0	37.5	34.0	38.0
Mantle width	. . .	—	13.5	—	14.0	—	16.0
Head width	. . .	—	10.0	—	12.1	—	—
Fin length	. . .	—	28.0	14.0	31.0	—	31.0
Fin width	. . .	—	31.0	18.0	33.6	—	31.0
Arm length I	. . .	—	21.0	—	20.0	—	16.5
II	. . .	—	17.0	—	20.0	—	19.0
III	. . .	—	20.5	—	20.0	—	20.0
IV	. . .	—	26.0	—	28.0	—	29.0
Tentacle length	. . .	—	—	—	—	—	57.5
Club length	. . .	—	—	—	—	—	10.0
Arm hooks I	. . .	—	17	—	17	—	17
II	. . .	—	17	—	19	—	20
III	. . .	—	21	—	20	—	19
IV	. . .	—	23	—	28	—	23+



arm, are found in this species. The five photophores on the eyeball are located on the ventral periphery, are round and reddish-brown in colour. The terminal organs are about twice the size of the medians and are set apart from them.

On the tips of the ventral arms are found the characteristic large terminal photophores. These organs are very large in this species, ovoid to round, and set deeply into the aboral surface of the arm tip. Apparently there are three organs in complete specimens but, as these are often missing, no average could be determined. In some they were missing entirely and, when the skin is peeled off by net action, there may be no indication of their former presence.

*Discussion*: The relationship of this species with the other related forms will be discussed in a revision of the subfamily Abraliinae now being drawn to completion.

*Distribution*: Known only from South African waters.

*Abraliopsis pfefferi* Joubin, 1896

*Abraliopsis pfefferi* Joubin, 1896: 19; Pfeffer, 1912: 156.

*Material*: 1 ♂, mantle length 20.5 mm, 500 m from 27°00'S, 43°39'E, SSE. of Natal, IKMT No. 45, February 21, 1963, SAM A29755.

Considerable confusion has existed in the literature concerning the identification of *Abraliopsis pfefferi* and its relationship to the other species of the genus. From the members of the subgenus *Micrabralia* (*affinis*, *lineata*, *gilchristi*) it can be distinguished by the diffuse distribution of the photophores on the ventral surface of the head, while from its closest relative *A. (Abraliopsis) hoylei* (Pfeffer, 1884) it can readily be separated by the presence of a semicircular flap or membrane in the carpal region of the tentacular club and by the absence of minute, ringed suckers on the tips of the arms between the terminal hooks and the terminal minute fleshy suckers.

*Distribution*: This species appears to be confined to the Atlantic Ocean and the Mediterranean Sea, being replaced in the Indo-Pacific by *A. hoylei*. This is the only record from the Indian Ocean.

*Abraliopsis* sp.

*Material*: 1 spec., mantle length 20.0 mm, in 500 m from 26°42'S, 40°07'E, SSE. of Natal, IKMT No. 46, February 22, 1963, SAM A29749.

This specimen is in such poor condition that definite identification is nearly impossible. It may be a young, mutilated specimen of *Abraliopsis gilchristi*.

Subfamily **Pyroteuthinae**

*Pyroteuthis margaritifera* (Rüppell, 1844)

*Enoploteuthis margaritifera* Rüppell, 1844: 129.

*Pyroteuthis margaritifera*, Hoyle, 1904: 42; Chun, 1910: 136, pl. 11, figs. 1-4 (full description and figures); Pfeffer, 1912: 196, pl. 19, figs. 17-30 (detailed description, distribution).

*Material*: 1 ♀, mantle length 43.0 mm, in 500 m from 32°30'S, 35°08'E, IKMT No. 31, August 12, 1962, SAM A29727. — 1 ♀, mantle length 21.0 mm, in 500 m

from 25°30'S, 40°40'E, IKMT No. 34, August 19, 1962, SAM A29697.—1 ♀, mantle length 17.0 mm, in 200 m from 30°30'S, 31°45'E, IKMT No. 37, August 23, 1962, SAM A29699.—1 ♂, mantle length 29.0 mm, in 500 m 27°00'S, 43°39'E, SSE. of Natal, IKMT No. 45, February 21, 1963, SAM A29754.—1 ♀, mantle length 27.0 mm, in 500 m from 28°07'S, 33°28'E, IKMT No. 47, SAS Natal, February 24, 1963, SAM A29746.—1 indet., mantle length 12.0 mm, in 500 m from 27°00'S, 43°39'E, IKMT No. 45, SAS Natal, February 21, 1963, SAM A29753.

This is a common mesopelagic species living in the upper 600 metres of water. It is somewhat similar in appearance to *Pterygioteuthis* but may immediately be distinguished from it by the presence of hooks on the tentacular club and hectocotylization of the right ventral arm. The eyeball bears 12 light organs and the oviduct is on the left side.

*Distribution*: Widely distributed in the Mediterranean and Atlantic from the surface to about 600 metres. This appears to be the first record from the Indian Ocean of the typical form.

*Pterygioteuthis gemmata* Chun, 1910

*Pterygioteuthis gemmata* Chun, 1910: 108, pl. 13, fig. 3, pl. 14, figs. 4, 5, 9, pl. 15, figs. 2-3, 6-12, pl. 16, figs. 1-2, 5, 7-19; Thiele, 1920: 447, pl. 54, figs. 10-12.

*Material*: 1 ♂, mantle length 22.0 mm, in 500 m from 30°49'S, 45°47'E, SSE. of Natal, IKMT No. 44, February 19, 1963, SAM A29744.—2 ♂♂, mantle length 18.2, 17.9, in 200 m from 30°30'S, 31°45'E, IKMT No. 37, August 23, 1962, SAM A29699.—? 1 ♀, mantle length 20.0 mm (badly damaged), in 100 m from west of Slangkop, IKMT No. 19, November 11-12, 1961, SAM A29735.

This species, closely related to the preceding, is distinguished by the characters stated previously. From its closest relative, *Pterygioteuthis giardi* Fischer, 1895, it may be separated by means of the following table.

<i>gemma</i>	<i>giardi</i>
1. I-III arms with 3-5 hooks in midpart of ventral row.	1. I-III arms with a pair of hooks in midpart.
2. Hectocotylus with a comb-like series of teeth.	2. Hectocotylus with two hooklike teeth.
3. 14 light organs on eyeball.	3. 15 light organs on eyeball.
4. Ventral arms with minute paired suckers on left, with a single row on right arm of male.	4. Ventral arms without hooks and suckers.

This is a common mesopelagic species.

*Distribution*: This has been reported from the South Atlantic by Chun and from the tropical Atlantic by Thiele. It is probably widely distributed in the oceans.

Family **Onychoteuthidae***Onychoteuthis banksi* (Leach, 1817)

*Onychoteuthis banksi*, Pfeffer, 1912: 70, pl. 3, figs. 13-25, pls. 4, 5, 6.

*Material*: 1 ♀, mantle length 66.0 mm, in 15 m from west of Slangkop, IKMT No. 15, September 8-9, 1961, SAM A29731.—3 ♀♀, mantle lengths 56.0-76.0 mm, surface from 3°30'S, 35°08'E, dipnetted at night, SAM A29739.—1 juvenile, mantle length 22.2 mm, in 500 m from 31°44'S, 44°35'E, from stomach of *Alepisaurus ferox*, IKMT No. 32, August 15, 1962, SAM A29715.—1 juvenile, mantle length 24.0 mm, in 500 m from 31°44'S, 44°35'E from stomach of *Alepisaurus ferox*, IKMT No. 32, August 15, 1962, SAM A29720.—1 juvenile, mantle length 24.0 mm, in 500 m from 31°44'S, 44°35'E, from stomach of *Alepisaurus ferox*, IKMT No. 32, August 15, 1962, SAM A29713.

This is one of the commonest oceanic cephalopods, the young often caught in plankton nets. I have noted elsewhere (Voss, 1960): 'The young may easily be identified from all other squids by the sleek, compact appearance with partially withdrawn head, nearly terminal fins, beyond which projects the sharp, tapered, slightly curving and transparent conus of the gladius, and the dark streak along the dorsal midline of the mantle composed of the visible rib of the gladius with a streak of closely set brown chromatophores over it.' The adults are readily identifiable by the large hooks on the clubs and the dark dorsal midline.

*Distribution*: Cosmopolitan in all seas from the North Cape to Cape Horn.

? *Onykia* sp.

*Material*: 1 juvenile, somewhat damaged, in 500 m from 26°38'S, 44°28'E, IKMT No. 33, August 17, 1962, SAM A29703.

This specimen is flaccid and in poor condition. From the available characters it seems to belong to the genus *Onykia* but specific determination is doubtful.

*Tetronychoteuthis dussumieri* (Orbigny, 1839)

*Tetronychoteuthis dussumieri*, Pfeffer, 1912: 98, pl. 13, pl. 14, figs. 10-14.

*Tetronychoteuthis massyae* Pfeffer, 1912: 102, pl. 14, figs. 15-19.

?*Tetronychoteuthis* sp. Robson, 1926: 4.

*Material*: 1 juvenile, mantle length 25.0 mm, in 500 m 31°44'S, 44°35'E, from stomach of *Alepisaurus ferox*, IKMT No. 32, August 15, 1962, SAM A29716.

This species has only been recorded a few times in the literature and is considered rather rare. However, the writer now has at his disposal a small series of specimens from the Gulf of Mexico and the south-eastern Pacific which indicate that it may be fairly common. A careful study of all of the specimens available is yet to be made, but a cursory examination indicates that the differences in the surface tubercles between *dussumieri* and *massyae* is due to age differences as Pfeffer had suggested.

This species can be easily recognized under the microscope or with a hand



lens by the presence of small stalked tubercles covering the mantle, like paving. The stalks bear discs distally which in the young (*massyae* stage) are star-shaped with numerous points but in adults are round and smooth-edged. There are numerous dorsal nuchal folds.

*Distribution*: Gulf of Mexico, south-eastern Pacific (Voss), Mauritius (Orbigny), 46°S, 120°E (Pfeffer), off South Africa!

#### Family **Bathyteuthidae**

##### *Ctenopteryx sicula* (Verany, 1851)

*Ctenopteryx sicula*, Pfeffer, 1912: 332.

*Material*: 1 juvenile, mantle length 13.1 mm, in 500 m from 31°44'S, 44°35'E from stomach of *Alepisaurus ferox*, IKMT No. 32, August 15, 1962, SAM A29711.

This is a small specimen in poor condition due to the digestive juices of the fish from which it was taken. This species is easily distinguished from all other known species by the presence of lateral fins extending from near the anterior mantle margin to the posterior end. The fin is composed of numerous strong, finely tapered supports or trabeculae united by a delicate, thin membrane. In all except perfect specimens the membrane is partially torn between the supports so that the animal appears to be surrounded by a fringe, hence the generic name—comb fin.

Although not often reported in the literature, this is a common species, occupying the surface layer.

*Distribution*: Probably world wide in distribution and recorded from the Mediterranean Sea, South Atlantic and Pacific, off South Africa!

#### Family **Veranyidae**

##### ?*Octopodoteuthopsis* sp.

*Octopodoteuthopsis* sp. Robson, 1924b: 606, text-fig. 8.

*Material*: 1 juvenile, mantle length 19.0 mm, in 100 m from west of Slangkop, IKMT No. 24, November 15, 1961, SAM A29707.

This specimen, unfortunately, is in very poor condition and little can be added to Robson's description. Its condition does not permit specific identification. There is no trace of tentacles or their bases. The hooks on the arms are very slender and curved to form no less than a 90° angle and usually more. The mantle projects only slightly beyond the fins which are much wider than long.

The funnel organ is much as described and figured by Robson but the anterior angles are more rounded and the central slit shown in his figure is the result of the slender terminal papilla having been broken off as occurred in the present specimen.

As this is only the second specimen no assumption is warranted as to their vertical distribution.

*Distribution*: Off Cape Town (Robson).

Family **Histioteuthidae\****Histioteuthis dofleini* (Pfeffer, 1912)

*Calliteuthis ocellata*, Chun, 1910: 147-170 (in part: only references to *C. ocellata*), text-figs. 22, 23, text-pl. 1, figs. 1, 2, pl. 20, figs. 7-9.

*Stigmatoteuthis dofleini*, Sasaki, 1929: 258, text-figs. 126, 127, pl. 22, figs. 1-3.

*Material*: 1 ♀, mantle length 15.0 mm, in 500 m from 25°30'S, 40°40'E, IKMT No. 34, August 18, 1962, SAM A29698.—1 ♀, mantle length 13.3 mm, in 500 m from 26°42'S, 40°07'E, IKMT No. 46, S. of Natal, Indian Ocean, February 22, 1963, SAM A29750.

These two juveniles are the first specimens of this species recorded from African waters. They are distinguished by certain details in their photophore pattern and by the sculpture on the surface of the dorsal pad of the funnel organ. On the dorsal pad, a strong ridge originating at the anterior apical papilla runs medially down each limb expanding into a broad flap on the posterior half. On the base of arms IV, the photophores are arranged in three to four longitudinal rows; on the ventral surface of the mantle, the photophores are rather widely set, with a diagonal row commencing at the lateral angle containing about nine organs; seventeen large photophores form a circlet around the margin of the right eyelid. The male of this species is unique in the family in possessing a double set of functional genitalia.

Despite the sparsity of literature on this species, it appears from collections made principally by the *Dana* and U.S. Fish and Wildlife vessels to be one of the commonest and most widespread of the histioteuthids. A full study of *H. dofleini* will appear in a forthcoming monograph of the family by N. Voss.

*Distribution*: From the literature and unpublished material, *H. dofleini* occurs widespread in the North Atlantic and the North Pacific, and, on the basis of the present specimens, occurs in the Indian Ocean. It is found from the surface to about 1500 metres.

*Histioteuthis bonnellii* (Férussac, 1835)

*Histioteuthis bonnelliana*, Pfeffer, 1912: 297, pls. 23, 24, 25.

*Material*: 1 ♀, mantle length, 17.3 mm, in 500 m from 32°30'S, 35°08'E, IKMT No. 31, August 12, 1962, SAM A29724.

This species is known from waters off the north and north-western coasts of Africa but the present small female is the first record from off the south-eastern coast.

*H. bonnellii* is easily recognized by the deep inner web connecting the arms for approximately 50 per cent or more of their length, the presence of a single enlarged elongate photophore on the tip of arms I, II and III, and a six-membered buccal membrane.

\* The information and descriptions on the family Histioteuthidae given here are by N. Voss. A full monographic treatment of the family is now in press.



*Distribution*: *H. bonnellii* is known from throughout the North Atlantic, the Mediterranean, the Indian Ocean off South Africa (present specimen), and possibly off the south-west coast of Australia. It has been collected at depths down to approximately 3000 metres.

*Histioteuthis* sp.

*Histioteuthis bonelliana*, Robson, 1924b: 608, text-figs. 9-12.

*Material*: 1 ♀, mantle length approx. 55 mm, in 400 m from west of Slangkop, IKMT No. 18, September 9, 1961, SAM A29637.

This specimen, in very poor condition, is identical with two specimens collected by the s.s. *Pickle* from an area just a few degrees north of the location of the present specimen. Robson identified these specimens as *H. bonelliana* but noted a number of differences between his material and that described by Pfeffer, Chun, etc., for *bonelliana*.

A study of Robson's material, which is deposited in the British Museum, and the present specimen reveals important differences between these individuals and members of the species *H. bonnellii* (= *H. Bonelliana*). Like *bonnellii*, this new material has the deep inner web between the arms and the single enlarged elongate photophore on the tip of arms I, II and III, but differs most strikingly in having a seven-parted buccal membrane rather than a six-parted one.

The identity of this specimen together with those of Robson must await a complete study and description in the afore-mentioned monograph.

*Distribution*: Known at present from off the west coast and southern tip of South Africa from depths of +720 to 1755 metres.

*Histioteuthis meleagroteuthis* (Chun, 1910)

*Meleagroteuthis hoylei*, Pfeffer, 1912: 291, pl. 22, figs. 1-8.

*Material*: 1 ♂, mantle length 38.0 mm, in 500 m from 35°42'S, 24°10'E, IKMT No. 42, November 17-18, 1962, SAM A29738.

This specimen, in very good condition, is the first record of this species from African waters. The species has been seldom recorded in the literature, but is commoner than is supposed, being represented in the yet undescribed *Dana* collections by a number of specimens.

The species is easily distinguished by the densely set small photophores, particularly on the ventral surface of the mantle and head; a median line of tubercles on the dorsal surface of the mantle and on the basal half to two-thirds of arms I, II and III; and a seven-membered buccal membrane. On the ventral surface of the mantle, a diagonal row of photophores commencing near the lateral angle on the anterior margin contains approximately 25 photophores; on the base of arms IV, the photophores are set in nine longitudinal rows.

*Distribution*: *H. meleagroteuthis* is known from throughout the North Atlantic (Joubin, unreported *Dana* material); the South Atlantic off the tip of South Africa (present specimen); and throughout the North Pacific (Pfeffer, Joubin, Adam, Sasaki, Akimushkin, and Voss) from depths of 494 to 730 metres.

#### Family **Ommastrephidae**

##### *Todaropsis eblanae* (Ball, 1841)

*Todaropsis eblanae* (Ball), Voss, 1962: 264.

*Material*: 1 ♂, mantle length 42.0 mm, in 100 m from west of Slangkop, IKMT No. 19, November 11–12, 1961, SAM A29737.—1 juvenile, badly damaged, in 200 m from north-west of Cape Town, IKMT No. 27, November 16, 1961, SAM A29691.

Two specimens in poor condition were represented in the collections. This is a common species in the eastern Atlantic and has been well described by various authors. For sources for distributional records see Voss, 1962.

##### *Ornithoteuthis* sp.

*Material*: 1 ♀, mantle length 66.0 mm, in 500 m from 26°38'S, 44°28'E, from stomach of *Alepisaurus ferox*, IKMT No. 33, August 17, 1962, SAM A29721.

A single half-grown female of *Ornithoteuthis* in fair condition was found in the collections from *Alepisaurus* stomachs. It is unfortunate that the specimen is not an adult and in good shape in order to determine whether it belongs to the oriental *O. volatilis* Sasaki, 1915 or to the Atlantic *O. antillarum* Adam, 1957.

This specimen shows adequately the generic characters: long slender tail-like mantle tip and fins, a light organ on the ventral surface of the eyeball and two light organs on the ventral side of the visceral mass, the anterior one oval, the other a long slender luminous stripe down the midline. There is a distinct foveola in the funnel groove.

#### Family **Chiroteuthidae**

##### *Chiroteuthis capensis*, n. sp.

Pl. IV, a–g; Pl. V, a–h

*Material*: *Holotype*.—1 ♀, mantle length 100.0 mm, in 400 m west of Slangkop, IKMT No. 18, September 9, 1961, SAM A29730.

The mantle is long and slender, squarely truncate ventrally but produced dorsally in the midline in a triangular lappet. It is widest near the anterior margin and tapers gradually to the level of the insertion of the fins. Anteriorly the mantle wall is thin and muscular; at the level of the fins it becomes thick, choroidal and tubular and tapers only very slightly posteriorly. It is broken off just posterior to the end of the fins, with the end of the broken gladius somewhat projecting.

The fins are nearly circular in outline but taper slightly both anteriorly and posteriorly. There are no free anterior lobes. The fins are rather thick and fleshy.

The funnel is small, with a small tubular opening, and is free for only a few millimetres. The sides of the soft neck tissue appear to be fused to the funnel but are free in the present specimen with the funnel attachment muscles only being securely fused to the funnel in a large area near the opening. The funnel-mantle locking apparatus is simple. The mantle member is a small raised ridge, set obliquely on the mantle and tapering anteriorly so that in side view it resembles the outline of a human nose. The funnel member is slightly oval with the groove forming an  $\perp$  shaped structure. The funnel organ is large. The dorsal member is shaped like a broad inverted heart but blunt anteriorly. On its inner surface it bears a narrow median ridge terminating in a small papilla. Laterally there is a broad ridge on each side, narrow anteriorly, but broadening posteriorly. The ventral pads are large, elliptical, with a thickened inner ridge.

The head is long and tubular but squarish in the area of the eyes. Typically chiroteuthid, the eyes are situated about midway between the arm bases and the end of the funnel. The long neck region has collapsed but in life it would probably be about as wide as the head proper. Only one eye is present. It is large and bears traces of an inner and outer solid row of photogenic material each end terminating in a roundish patch. There is an olfactory organ postero-ventrally on either side of the head. It consists of a long slender tube broadened at the end but the shape of the terminal lobe cannot be accurately determined.

The arms are long, round in cross-section, but flattened aborally. The bases are rather stout but taper to slender attenuate tips. They are in the order  $4:3=2:1$ . Arms I noticeably shorter than the others while IV are very long and stout. The skin is rubbed off almost all the arms so that little can be determined concerning keels, protective membranes, etc. Only the right third arm bears a distinct swimming keel in its present condition. All of the arms bear two rows of suckers born on slender pedicels set on broad pad-like bases. The suckers of the midportion of the arms bear about 8-10 long, slender, sharp teeth on the distal edge and about twenty, low, blunt teeth on the rest of the circumference. The teeth of the distal suckers are slender and sharp while those of the basal suckers are short and broad.

The tentacles are exceedingly long. The stalks are very slender and in their present skinless condition lack suckers over the greater length. The club is slightly larger than the stalk and is about one-fifth the total length. Basally there is a solid fringe of lappets originating in the carpal region and covering a very small area. Beyond this the fringe separates into single broad pointed lappets united by a thin transparent membrane. These individual lappets border the club on each side to the tip of the club which ends in a long oval light organ. The suckers are in four rows arranged in groups of two at the base of each lappet. The outer suckers have a stalk about twice as long as the inner ones. Both the inner and outer stalks bear an outer raised keel which terminates



distally in a lappet-like crest. Each sucker is hood-shaped, open on its inner surface. The inner ring is toothed and bears a single large hooked tooth on the distal margin with about 7-8 teeth on each side. Of these latter, the ones close to the median tooth are larger and slender while the proximal ones are shorter and broader. The proximal base is slightly irregular but not toothed.

The buccal membrane was badly torn and in very poor condition so that its structure could not be made out. However, the attachments were visible and were dorsally inserted on I, and II, and ventrally on III, and IV.

An examination of the viscera showed little detail. The specimen was a female indicated by the presence of small nidamental glands. The posterior section of the mantle contained a considerable concentration of large fatty cells.

Of possible considerable importance is the lack of any trace of a light organ on the ventral surface of the liver. The most careful examination failed to reveal a trace of present or former organs.

The mantle, funnel, head and arms still retain some skin which bears reddish violet chromatophores, more particularly on the dorsal aspect.

There are no indications of light organs on the body and head. There is a row of possible photophores along the base of the swimming keel of the third arms. These are rather small and regularly spaced. On the ventral arms the skin is missing except in two or three small patches but in these the typical large photophores are interspersed between the suckers of the ventral row.

TABLE 2. Measurements (in mm) of the holotype of *Chiroteuthis capensis*, n. sp. from South African waters.

Trawl number	. . . . .	18	Arm length I	. . . . .	48.5
Sex	. . . . .	♀	II	. . . . .	58.0
Mantle length	. . . . .	100.0	III	. . . . .	60.0
Mantle width	. . . . .	14.2	IV	. . . . .	204.0
Head width	. . . . .	22.0	Tentacle length	. . . . .	500.0
Fin length	. . . . .	50.5	Club length	. . . . .	146.0
Fin width	. . . . .	45.5			
Sucker diameter I	. . . . .	.6			
II	. . . . .	.8			
III	. . . . .	.96			
IV	. . . . .	1.12			
Tentacular sucker	. . . . .	1.12			

*Type.* South African Museum SAM A29730.

*Type locality.* West of Slangkop, South Africa.

*Discussion.* At this time five large species of *Chiroteuthis* are known: *veranyi*, *lacertosa*, *imperator*, *picteli*, and *macrosoma*. All of the other species, belonging to various genera and subgenera, are in my opinion larval stages of these or other adult forms and are not referable to identified adults. Their names should be dropped from consideration (see also Joubin, 1924, p. 79). *C. veranyi* and *lacertosa* are closely related forms and it may be that *lacertosa* is a subspecies of *veranyi* as Pfeffer (1910) has proposed. They are easily separated from the other

species by the prominent strongly striped skirt around the pedicels of the tentacular suckers just below the suckers. In *veranyi* the light organs on the ink sac are round, in *lacertosa* they are oblong, tapered at the ends. In 1933 Joubin, under the name *C. lacertosa*, described and figured a specimen taken by the *Dana* at station 1171 II at 8°19'N, 44°35'W. He misidentified this as *lacertosa*, and, drawing attention to the single light organ on the ink sac and the multiple light organs on the eyeball, he stated that *lacertosa* was not a subspecies of *veranyi*. Unfortunately, for Joubin, the type of *lacertosa* in the U.S. National Museum has, as mentioned above, two light organs on the ink sac and two strip organs on the eyeball. The specimen described in his 1933 paper is actually a new species and I here name it *Chiroteuthis joubini* n. sp. The original description is Joubin, 1933, pp. 26-30, figs. 23-29.

The remaining three species of *Chiroteuthis* are closely related and very similar. *C. picteti* and *C. imperator* were both well described and illustrated, the latter profusely so. While many features are similar to the present species, they are easily separable on the basis of the three rows of light organs on the eyeball, differences in the tentacular club, and the presence of double light organs on the ink sac. *C. macrosoma* was insufficiently described by Goodrich (1896); it has no tentacles and the light organs were not mentioned. On the basis of the radula which was figured and the differences in the suckers, I consider the present species to be distinct from *macrosoma*. It is unique among known chiroteuthids by the lack of light organs on the ink sac.

### Family **Cranchiidae**

#### Subfamily **Cranchiinae**

#### ?*Pyrgopsis pacifica* (Issel, 1908)

#### Pl. VI, a-e; Pl. VII, a-i

*Pyrgopsis pacifica*, Robson, 1924b: 619; Sasaki, 1929: 338.

*Material*: 1 ♀, mantle length 63.0 mm, west of Slangkop, from *Alepisaurus ferox* stomach, IKMT No. 14 in 500 m, September 8, 1961, SAM A29705.— 3 ♂♂, 3 ♀♀, mantle lengths 40.0-52.0 mm, in 15 m west of Slangkop, IKMT No. 15, September 8-9, 1961, SAM A29722.— 1 ♀, mantle length 61.0 mm, in 100 m north-west of Cape Town, IKMT No. 27, November 16, 1961, SAM A29692.

The eight specimens grouped here under the name *Pyrgopsis pacifica* are placed here only tentatively since the status of the various species in the genus, and the genus itself, is in dispute. In addition, there are certain inexplicable differences between the specimens which may, or may not, be of specific nature.

All of the specimens have the mantle considerably contracted and wrinkled so that detailed descriptions of the shape cannot be given. However, the body is long and slender, somewhat spindle-shaped. The anterior margin seems to be



slightly produced in the mid-dorsal region and slightly excavated beneath the funnel. The anterior margin is fused to the head in the neck region and on each side of the funnel. The mantle is widest just posterior to the anterior margin and thence tapers gradually to the anterior insertions of the fins where it becomes slender and attenuate. On each side of the mantle, originating at the point of fusion to the funnel, is a line of tubercles. All but the last three on each side are united in a narrow basal cartilaginous strip. There are 10–12 multifid tubercles on each side. Those on the strip are separated by one or more small unicuspid tubercles.

The fins are large, terminal and transversely elliptical in outline. The conus of the gladius extends to the posterior edge.

The funnel is rather large and reaches to about the middle of the base of the ocular peduncles. The funnel organ varies somewhat in the specimens. The 63.0 mm specimen, probably a female, has a V-shaped dorsal funnel organ with a single foliate flap on each lower limb. The dorsal pads seem to be elliptical but indented on the inner posterior margin. In the remaining specimens whose funnel organs were observable, the lower limbs each bore a single long narrow flattened papilla.

In the three males from trawl No. 15, the right ventral arm is hectocotylized. It is longer than the left ventral arm, is turned dorsad on the outer portion, and the distal part of the arm is expanded on the ventral side by the enlargement and palisading of the sucker pedicels. The first six pairs of suckers are normal. From the seventh pair the ventral suckers remain comparatively large to the end of the arm. The dorsal suckers diverge from those of the ventral row to leave a large clear area in the oral face of the arm. The dorsal suckers become minute, on minute pedicels, and extend to the tip of the arm finally converging upon the ventral row at the tip.

The head is narrow and stalked as is characteristic of the genus and squarish in cross-section with sharp angles. The eyes are small, ovoid, on stout, fat ocular peduncles in the large specimens but in the smaller ones the stalks are slender. The eyes bear a rostrum on the ventral side and on the outer surface are two or more small photophores. The exact number could not be made out due to the poor condition of the specimens.

The arms are in the order 3.2.4.1. They are rounded and in the present specimens seem to lack any vestige of a protective membrane on any of the arms nor is any swimming keel noticeable. The arm suckers are small, largest on III in the distal three-fourths of the arm and bear chitinous rings equipped with about 10–12 small teeth on the distal portion but are smooth basally. The third arms are much longer and stouter than the others. In the large female from Slangkop the tip of each of the third arms is broadened, devoid of suckers and is bordered by a ruffled membrane exactly as shown in the figure. In the remaining males and females, which are smaller, there is no such expanded portion but instead the ends of the third arms are normal and bear numerous small suckers to the tip.

The buccal membrane is 7-lobed with seven supports united to the arms dorsally on I and II, ventrally on III and IV.

The tentacles are a little larger than the third arms. The stalks are slender, round, flattened on the oral surface and bear short, slightly expanded clubs bordered by a protective membrane and with an aboral swimming keel. The suckers are in four rows, the median suckers large, three to four times the size of the marginal suckers. The median sucker rings are formed by a smooth inner ring surrounded by a broad papillated collar whose innermost papillae form a row of small, blunt teeth. There is no distinct carpal cluster but suckers and buttons extend down the stalk nearly to the base of the tentacle.

The liver is prominent and shaped like a stout cigar. It is suspended obliquely in the mantle cavity.

The mandibles each bear a tooth on their inner corners as shown in the illustration. The radula is as figured; there are lateral cusps on the rhachidian and a prominent inner cusp with a smaller outer cusp on the admedians. The lateral plates are small and ovoid.

TABLE 3. Measurements (in mm) of the largest specimen of *Pyrgopsis pacifica* (Issel, 1908) from off South Africa

Sex . . . . .	?	Arm Length I . . . . .	4.1
Mantle length . . . . .	63.0	II . . . . .	12.0
Head width . . . . .	12.0	III . . . . .	26.5
Fin length . . . . .	19.0	IV . . . . .	9.8
Fin width . . . . .	29.5	Tentacle length . . . . .	37.0
Length tubercular ridge . . . . .	19.2	Club length . . . . .	6.4

*Discussion:* The specimens before me have been placed in *pacifica* for lack of a better identification and because they most closely resemble this species. I cannot account for the variation in the structure of the dorsal funnel organ member. This may be due to poor condition and be partly an artifact in the specimen from Sta. No. 14. Sasaki (1929) describes the flaps in his *pacifica* from the Japanese islands as being a triangular flap. Too much reliance cannot be placed on this character here.

The spoon-shaped organ on the end of the third arms on the female from Sta. No. 14 is not found on the other females. This may be due to the animal's somewhat larger size. It is not described in Sasaki's monograph.

Specimens of *Pyrgopsis* are very common in plankton tows. Most have been considered to be larval forms but Sasaki believed his large males to be adult and figured the male genitalia of a specimen of 52.0 mm mantle length. It corresponds well with the somewhat mangled largest male from Sta. No. 15. Two of the present females bore rudimentary nidamental glands but there were no signs of developing eggs.

It has been a commonly held opinion that *Pyrgopsis* might represent a larval stage of *Leachia*. This position seems doubtful. Two adult female *Leachia cyclura* listed by me from Bermuda (Voss, 1960) were both smaller than most of

the present material and were markedly different in appearance and general characters. The final word on *Pyrgopsis* must await a detailed study of a great deal of well-preserved material from the major oceans.

*Cranchia scabra* (Leach, 1817)

*Cranchia scabra*, Robson, 1924: 624, figs. 14-16.

*Material*: 1 ♀, mantle length 70.0 mm, in 500 m from 32°30'S, 35°08'E, IKMT No. 31, August 12, 1962, SAM A29726. — 1 ♀?, mantle length 40.0 mm, in 15 m from 60 miles west of Slangkop, IKMT No. 15, September 8-9, 1961, SAM A29626. — 1 ♀?, mantle length 35.0 mm, in 100 m from west of Slangkop, IKMT No. 20, November 12, 1961, SAM A29630. — 1 juvenile, length indet., in 500 m from 29°50'S, 31°29'E, IKMT No. 48, SAS Natal, February 25, 1963, SAM A29745. — 1 ♀, mantle length 35.0 mm, in 500 m from 27°00'S, 43°39'E, IKMT No. 45, SAS Natal, February 21, 1963, SAM A29752.

Apparently this is only the second record from South African waters of this very common cranchiid squid. Pfeffer (1912) has considered that the species may be divisible into several forms or subspecies for which he proposed names. However, the species appears to exhibit considerable individual variation and until a large series of specimens is available from all oceans and subjected to searching analysis, it seems preferable to retain all forms in the present species. It is easily recognized by the presence of numerous tubercles distributed over the entire surface of the mantle and much of the fins.

The young of this species are often found in the plankton catches from the epipelagic zone. Larger individuals inhabit the meso- and bathypelagic zones.

*Distribution*: Worldwide in tropical and temperate regions.

Subfamily **Taoniinae**

*Megalocranchia megalops australis*, new subspecies

Pl. VIII, a-e, Pl. IX, a-f

*Material: Holotype*. — 1 ♀?, mantle length 89.0 mm, in 500 m 38°52'S, 33°10'E, IKMT No. 40, November 13-14, 1962, SAM A29733. *Paratypes*. — 2 specimens, mantle lengths 39.0 and 29.0 mm, and damaged, in 500 m from 31°44'S, 44°35'E, from stomach of *Alepisaurus ferox*, IKMT No. 32, August 15, 1962, SAM A29714. — 1 juvenile, mantle length 24.0 mm, in 500 m from 32°30'S, 35°08'E, IKMT No. 31, August 12, 1962, SAM A29723.

*Description*: The mantle is oval, truncated anteriorly and tapering to a slender point posteriorly. It is widest at about the anterior third. It is fused to the head dorsally in the neck region without a lappet and marked only by a slender oval clear strip indicating the anterior end of the gladius. The point of fusion on each side of the funnel is marked by a small three or four pointed tubercle. The mantle is thin, muscular and liberally covered with large reddish brown separate spots which are arranged in a narrow but distinct row down the dorsal midline.



Posteriorly, the gladius widens in a generally slender diamond shape, widest just posterior to the anterior fin insertion. Posteriorly it tapers to a slender point.

The fins together are oval in outline, broadest in about the posterior third and border the posterior expanded part of the gladius but anteriorly are attached to the mantle wall. The fins overreach the end of the mantle only slightly.

The funnel is large, prominent, and reaches to the base of the ventral arms just anterior of the eyes. There is no funnel valve. The dorsal member of the funnel organ is U-shaped with slightly rounded posterior limbs. There is a long round papilla at the end of each limb and another in the posterior edge of the anterior central portion. The paired ventral members are ovoid, directed transversely with the narrow end pointed laterally.

The head is small with large projecting eyes. In the type, the skin is missing over the eyes. The olfactory organ is located posterior to the eyes immediately adjacent to the funnel on either side. It is cylindrical, slightly expanded distally and supported on a long slender pedicel. The eyes bear at least two large semicircular light organs ventrally and there are indications of another small one at the inner end of the small half moon organ. However, both eyes are badly damaged and the details cannot be discerned.

The arms are rather short, in the order 3.2.4.1, the third arms longer and stouter. The arms are rounded in cross-section and bear two rows of suckers bordered on each side by a prominent strongly trabeculate protective membrane of which the ventral one is usually slightly deeper. The basal arm suckers are all smooth ringed with no true teeth although under the highest power the larger distal suckers are toothed on the distal borders. The dorsal arms have normal suckers along their entire length, the distalmost only slightly larger than those of the midsection. Beyond the normal suckers the tip of the arm is slender and has about 3-4 rows of minute suckers visible only under high power. The dorso-lateral arms bear about 7-8 pairs of small suckers followed by about 3-4 pairs of slightly enlarged suckers. Beyond the distal suckers the tip of the arm is slender and has about 2-4 rows of minute suckers. The ventro-lateral or third arms bear about seven pairs of normal suckers increasing gradually in size distally, followed by about 4 pairs of noticeably enlarged suckers beyond which the suckers are again small. The tips of the third arms are not slender and do not have microscopic suckers. All of the suckers on the ventral arms are small with no differentiation in size.

The buccal membrane is 7-pointed with 7 supports. The supports are dorsally attached on arms I and II, ventrally attached on III and IV.

The tentacles are short, rather stout, with only slightly expanded clubs. The oral surface of the stalks are slightly flattened and with a slight median groove. On each side of the groove there is a pair of minute suckers arranged so that a line drawn through both pairs will form an angle to each other. The club is bordered on each side by a broad trabeculate membrane originating in the carpal region and extending to the tip of the club ventrally but not dorsally.

There is a short dorsal swimming keel.

The suckers of the manus are arranged in four rows, those of the hand large in comparison to the others, and mounted on rather long pedicels. The suckers bear chitinous rings with about 24–26 slender sharp teeth only slightly larger on the dorsal border. The suckers of the dactylus are small and have very small teeth.

The viscera were partially damaged but the liver is short, thick, cigar-shaped, supported transversely in the mantle cavity with the intestine attached to the posterior border and the rectum opening at the ventral tip of the liver.

The radula is as figured. The beaks are also figured.

TABLE 4. Measurements (in mm) of the holotype of *Megalocranchia megalops australis*, new subspecies, from off South Africa

Sex . . . . .	♀?	Arm length I . . . . .	15.0
Mantle length . . . . .	89.0	II . . . . .	18.5
Mantle width . . . . .	30.0	III . . . . .	25.0
Head width . . . . .	26.0	IV . . . . .	19.5
Fin length . . . . .	20±	Diameter of tentacular sucker . . . . .	.8
Tentacle length . . . . .	29.5	Diameter of arm sucker . . . . .	1.3
Club length . . . . .	9.0		

*Type*: South African Museum No. A29733.

*Type locality*: 28°52'S, 33°10'E.

*Discussion*: The entire problem of the affinities of the various species of the *Megalocranchia*—*Desmoteuthis*—*Teuthowenia* complex is a confusing one. It is not the purpose of this discussion to contribute further to the problem of the identity of the genus to which the species *megalops* belongs. This must wait for a detailed report upon the question now in preparation by the present writer. However, it must be stated that the problem really was created by the habit of numerous authors of creating genera and species on the basis of larval forms in which, by definition, adult characters are either not present or insufficiently developed. And despite some efforts to the contrary, it is almost impossible to trace out developmental sequences from long preserved larvae.

The problem has been considerably compounded in the Antarctic region by the work of Pfeffer and Chun. Unfortunately, the types and unique material upon which their specimens were based are now lost, probably due to the ravages of World War II, and we have only inadequate pictures and texts to rely upon. It is my opinion that these larval stages should be disregarded and future work based upon new material attaining at least juvenile stages.

The present specimens have been placed with reservation as a subspecies of *Megalocranchia megalops* because, in the stages available, they compare very favourably with this species. They differ from *M. megalops* consistently in the tuberculation of the mantle-funnel fusion area, the structure of the beaks, and the details of the radula. Since this form is a Southern Ocean form, as presently known, it seems safer to retain this as a subspecies rather than to identify it



with *megalops* or separate it as a new species. It differs from *Teuthowenia antarctica* Chun (1910) in a number of ways but, on the basis of the radula, is similar to Massy's *Teuthowenia antarctica* (Massy, 1916) whose identity is unknown. Similarly, it is distinct from Chun's *Desmotheuthis pellucida* in numerous characters.

*Remarks*: The name *australis* refers to its habitat in the southern hemisphere.

*Galiteuthis* sp.

*Material*: 1 juvenile, mantle length *ca.* 25 mm, in 100 m from west of Cape Town, IKMT No. 24, November 15, 1961, SAM A29708.

This small specimen is most closely referable to *Galiteuthis armata* Joubin but specific identification is not possible. Under high power with the dissecting microscope a few of the median suckers of the tentacular club appear to be in the transitional stage between normal toothed suckers and hooks. *Galiteuthis armata* has been previously reported from South African waters and it may prove that this is the young of this species.

Cranchiid

*Material*: 1 badly damaged specimen from 26°30'S, 33°40'E in 500 m, IKMT No. 36, August 21, 1962, SAM A29693.

This specimen is in such a poor condition that identification was not attempted.

OCTOPODA

Family **Bolitaenidae**

*Eledonella pygmaea* Verrill, 1884

*Eledonella massyae*, Robson, 1924, p. 672.

*Eledonella pygmaea*, Thore, 1949: 39, figs. 30-41.

*Material*: 1 head and attached viscera of a male from 26°38'S, 44°28'E in 500 m, IKMT No. 33, August 17, 1962, SAM A29702.

The single specimen in the collections is in poor condition and no further comments can be made concerning its identity or whether Thore (1949) was correct in synonymizing Robson's species under the older *pygmaea*, although the evidence presented by him is convincing to the present writer. For a detailed analysis of this species and considerations of its biology and habits see Thore's monograph. This is a bathypelagic species.

*Distribution*: Worldwide in tropical and temperate seas between about 50°N and 40°S (see Thore, 1949).

Family **Amphitretidae**

*Amphitretus pelagicus* Hoyle, 1885

*Amphitretus pelagicus*, Thiele, 1914: 532; Thore, 1949: 51, figs. 42-51.

*Material*: 1 specimen, badly damaged, from 30°30'S, 31°45'E in 200 m, IKMT No. 37, August 23, 1962, SAM A29700.

These delicate little octopods have twice before been reported from South African waters (Thiele, 1914, and Robson, 1930). The species is only known from the Indo-Pacific region, its closest approach to the Atlantic being the South African records. Few specimens of the species have been obtained and it is a pity that the present example is in such poor condition. For further information see Thore, 1949.

*Distribution*: Bathypelagic, known only from the Indo-Pacific region.

#### Family **Octopodidae**

*Octopus* sp.

*Material*: 10 juveniles, mantle length 10.5–17.0 mm, in 500 m from 31°44'S, 44°35'E from gut of *Alepisaurus ferox*, IKMT No. 32, August 15, 1962, SAM A29719.

The ten specimens listed above are very young juveniles of a species of the genus *Octopus*. Since, however, the adult characters are lacking it is impossible at the present stage of our knowledge of the life histories of the southern hemisphere octopods to venture upon an identification.

#### Family **Tremoctopodidae**

*Tremoctopus violaceus* Delle Chiaje, 1830

*Tremoctopus violaceus*, Robson, 1931: 206.

*Material*: 1 ♀, mantle length 24.0 mm, in 500 m from 31°44'S, 44°35'E, from stomach of *Alepisaurus ferox*, IKMT No. 32, August 15, 1962, SAM A29712. — 1 ♀, mantle length 16.0 mm, in 500 m from 26°42'S, 40°07'E SAS Natal, February 22, 1962, IKMT No. 46, SAM A29751.

This is apparently the first record of this species from South African waters, which are probably south of its normal range. The larger specimen is in excellent condition, having suffered little ill effects as a consequence of having been engulfed by its enemy, but the smaller one is somewhat damaged. This is another species which is sadly in need of a complete revision based upon large series of specimens. It is probably a tropical species infrequently entering cold temperate seas. For the only general discussion in the literature see Robson (1931).

*Distribution*: Epipelagic in all tropical and temperate seas.

#### Family **Ocythoidae**

*Ocythoe tuberculata* Rafinesque, 1814

*Ocythoe tuberculata*, Robson, 1931: 201.

*Material*: 1 ♀, mantle length 21.0 mm, in 15 m from west of Slangkop, IKMT No. 15, September 8–9, 1961, SAM A29704.

This is the first record from South African waters of this rather uncommon species. It is unfortunate that the present example is of such a small size that the distinctive adult characters are undeveloped. It is easily recognized by the absence of an interbrachial web, presence of ventral water pores only, and the complicated mantle-funnel locking apparatus unique among the octopods. The characteristic papillae found on the ventrum of the mantle in the females are just visible. This is an epipelagic species.

*Distribution*: Worldwide in tropical and temperate seas (Robson, 1931).

#### SUMMARY

An account is given of 112 specimens of bathypelagic cephalopods, belonging to 32 species, taken by midwater trawling in the seas around South Africa. Thirteen of these species were not previously known from this area. One new species, *Chiroteuthis capensis*, and one new subspecies, *Megalocranchia megalops australis*, are described.

#### ACKNOWLEDGEMENTS

The writer wishes to express his thanks to the Director of the South African Museum, Cape Town, for the opportunity to examine the collections and to the National Science Foundation for a grant-in-aid (NSF G-17940 and GB 1090) under which this study was partially accomplished. The illustrations were executed by Constance Stolen to whom grateful thanks are extended.

The Trustees of the South African Museum wish to thank the Council for Scientific and Industrial Research for a grant towards trawling costs.

#### REFERENCES

- ADAM, W. 1941. Résultats scientifiques des croisières du navire-école belge 'Mercator'. III (4). Cephalopoda. *Mém. Mus. r. Hist. nat. Belg.* **21**: 83-161.
- BALL, R. 1841. On a species of *Loligo* found on the shore of Dublin Bay. *Proc. R. Ir. Acad.* **1**: 362-364.
- BRUNN, A. F. 1943. The biology of *Spirula spirula* (L.). *Dana Rep.* **24**: 1-42.
- CHIAJE, S. DELLE. 1830. *Memorie . . . animali senza vertebre del Regno di Napoli*. **4**. Naples.
- CHUN, C. 1900. *Aus den Tiefen des Weltmeeres*. Jena: Fischer.
- CHUN, C. 1910. Die Cephalopoden. 1. Teil: Oegopsida. *Wiss. Ergebn. dt. Tiefsee-Exped. 'Valdivia'* **18**: 1-401.
- CHUN, C. 1914. Die Cephalopoden. 2. Teil: Myopsida, Octopoda. *Wiss. Ergebn. dt. Tiefsee-Exped. 'Valdivia'* **18**: 405-552.
- FERUSSAC, A. E. 1835. Note sur des céphalopodes nouveaux. *Annls. Sci. nat.* **3**(2): 339-390.
- GOODRICH, E. S. 1896. Report on a collection of Cephalopoda from the Calcutta museum. *Trans. Linn. Soc. Lond.* **7**: 1-24.
- GRINDLEY, J. R. & PENRITH, M. J. 1965. Notes on the bathypelagic fauna of the seas around South Africa. *Zool. afr.* **1**: 275-295.
- HOYLE, W. 1885. Diagnoses of new species of Cephalopoda. *Ann. Mag. nat. Hist.* (5) **15**: 222-236.
- HOYLE, W. 1904. Reports on the scientific results of the expedition to the tropical Pacific . . . on the . . . 'Albatross' . . . VI. Reports on the Cephalopoda. *Bull. Mus. comp. Zool. Harv.* **43**: 1-71.
- ISSEL, R. 1908. Raccolte planctoniche fatte dalla R. Nave 'Liguria' . . . Vol. I, fasc. IV. Mol-luschi. Parte 1. Cefalopodi planctonici. *Pubbl. Ist. Studi sup. prat. Firenze* **1908**: 201-243.

- JOUBIN, L. 1896. Observations sur divers céphalopodes. Première note: *Abraliopsis Pfefferi* (nov. gen. et spec.). *Bull. Soc. scient. med. Ouest* **5**: 19-35.
- JOUBIN, L. 1924. Contribution à l'étude des céphalopodes de l'Atlantique nord. *Résult. Camp. scient. Prince Albert I* **67**: 1-113.
- JOUBIN, L. 1933. Notes préliminaires sur les céphalopodes des croisières du 'Dana' (1921-1922), 4<sup>e</sup> partie. *Annls. Inst. océanogr., Monaco* **13**: 1-49.
- LEACH, W. E. 1817. Synopsis of the orders, families, and genera of the class Cephalopoda. *Zool. Misc.* **3**: 137-141.
- LINNAEUS, C. 1758. *Systema naturae*. Ed. 10 **1**.
- MASSY, A. L. 1916. Mollusca. Part II. Cephalopoda. *Nat. Hist. Rep. Br. Antarct. Terra Nova Exped.* **2**: 141-175.
- MASSY, A. L. 1927. The Cephalopoda of the South African Museum. *Ann. S. Afr. Mus.* **25**: 151-167.
- ORBIGNY, A. d'. 1834/48. In Ferussac & Orbigny. *Histoire naturelle générale et particulière des céphalopodes acétabulifères vivants et fossiles*. Paris: Baillière.
- PFEFFER, G. 1912. Die Cephalopoden der Plankton Expedition. *Ergebn. Atlant. Ozean Plankton-expd. Humboldt-Stift.* **2** (F.a.): 1-815.
- QUOY, J. R. & GAIMARD, J. P. 1832. Mollusques. In *Voyage de . . . l'Astrolabe . . .* 1826-29. Zoologie, **2**. Paris.
- RAFINESQUE-SCHMALTZ, C. S. 1814. *Précis des découvertes et travaux somiologiques . . .* Palermo.
- ROBSON, G. C. 1924a. Preliminary report on the Cephalopoda (Decapoda) procured by the S.S. 'Pickle'. *Rep. Fish. mar. biol. Surv. Un. S. Afr.* **3**(9): 1-14.
- ROBSON, G. C. 1924b. On the Cephalopoda obtained in South African waters by Dr. J. D. F. Gilchrist in 1920-21. *Proc. zool. Soc. Lond.* **1924**: 589-686.
- ROBSON, G. C. 1925. On a new species of *Rossia* from South Africa. *Ann. Mag. nat. Hist.* (9) **15**: 450-454.
- ROBSON, G. C. 1926. The Cephalopoda obtained by the S.S. 'Pickle'. Supplementary report. *Rep. Fish. mar. biol. Surv. Un. S. Afr.* **4**(8): 1-6.
- ROBSON, G. C. 1930. Cephalopoda, I. Octopoda. 'Discovery' *Rep.* **2**: 373-402.
- ROBSON, G. C. 1931. *A monograph of the recent Cephalopoda. Part II. The Octopoda*. London: British Museum (Nat. Hist.).
- RÜPPEL, W. P. E. 1844. *Intorno ad alcuni cefalopodi del mare di Messina lettera . . .* Messina.
- SASAKI, M. 1929. A monograph of the dibranchiate cephalopods of the Japanese and adjacent waters. *J. Coll. Agric. Hokkaido imp. Univ.* **20** (suppl.): 1-357.
- STEENSTRUP, J. 1875. *Hemisepius*, en ny slaegt af *Sepia*—blaeksprutternes familie med bemærkninger om *Sepia*—formerne i almindelighed. *K. danske Vidensk. Selsk. Skr.* (5) **10**: 465-482.
- THIELE, J. 1920. Die Cephalopoden der deutschen Südpolar-Expedition 1901-1905. *Dt. Südpol. Exped.* (16) *Zool.* **8**: 433-465.
- THORE, S. 1945. On the Cephalopoda of Professor O. Carlgren's expedition to South Africa in 1935. *K. fysiogr. Sällsk. Lund Förh.* **15**(7): 49-57.
- THORE, S. 1949. Investigations on the 'Dana' Octopoda. *Dana Rep.* **33**: 1-85.
- VERANY, J. B. 1851. *Céphalopodes de la Méditerranée*. Gènes.
- VERRILL, A. E. 1884. Second catalogue of Mollusca recently added to the fauna of the New England coast, etc. *Trans. Conn. Acad. Arts Sci.* **6**: 139-294.
- VOSS, G. L. 1955. The Cephalopoda obtained by the Harvard-Havana expedition off the coast of Cuba in 1938-39. *Bull. mar. Sci. Gulf Caribb.* **5**: 81-115.
- VOSS, G. L. 1960. Bermudan cephalopods. *Fieldiana, Zool.* **39**: 419-446.
- VOSS, G. L. 1962. South African cephalopods. *Trans. R. Soc. S. Afr.* **36**: 245-272.
- VOSS, G. L. 1962a. A monograph of the Cephalopoda of the North Atlantic. I. The family Lycoteuthidae. *Bull. mar. Sci. Gulf Caribb.* **12**: 264-305.